

find matter for industry and patience. I have done a little in this subject, but not enough to deserve any special mention. In order, however, to diminish the difficulties, the investigation may be provisionally restricted to the mutual actions of the *envelopes*, neglecting for the time that of the *nuclei*, which may be considered as a disturbing cause, for which some correction may afterwards have to be made.

So much then for the mathematical and theoretic development of molecular mechanics. There remains the third part, which, though the most laborious of all, will yet give the greatest pleasure to scientific men; since it is less dry, and opens a way for attaining the end aimed at in the natural sciences. Of this third part I will add a few words.

III. APPLICATION OF THE PRINCIPLES OF MOLECULAR MECHANICS.

[Under this head the author points out the various properties of bodies which would have to be explained, and of which he conceives an explanation might be afforded could the mathematical calculations be effected which are required for the elaboration of his theory, and enunciates the following conclusions as deduced from his explanation of the impact of bodies.]

1. If a body does not contain any repulsive elements, it cannot cause any retardation in the movement of any impinging body.

2. Again, if the medium through which a body moves contain no repulsive elements, no retardation of its motion can take place.

3. If a medium does contain repulsive elements, retardation must necessarily take place.

4. Consequently, as the planets in their movements through the æther do not suffer any loss of velocity, it must be concluded that the æther does not contain any repulsive elements at all, and that its elasticity must be explained without any recourse to repulsive forces.

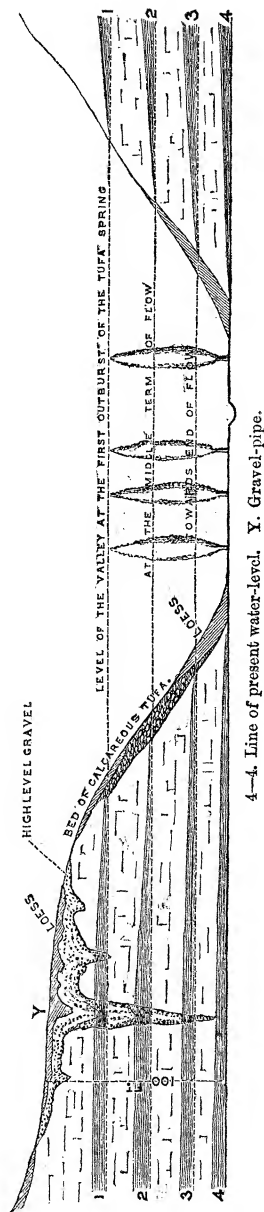
This last inference is somewhat wonderful, and decidedly curious: but after much consideration it appeared to me so natural, and so well harmonizing with other truths and scientific theories, that I ceased to hesitate about its adoption and gave it a most decided assent; whether wisely or not, I leave others to judge.

III. "On some further Evidence bearing on the Excavation of the Valley of the Somme by River-action, as exhibited in a Section at Drucat near Abbeville." By JOSEPH PRESTWICH, F.R.S.
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On the occasion of a late visit to Abbeville, I noticed a fact which appears of sufficient interest, as bearing upon and confirming one of the points treated of in my last paper, to induce me to submit a short notice of it to the Royal Society. It occurs in a tributary valley to that of the Somme, but necessarily forms part of the general phenomena affecting the whole basin.

The small stream (the Escardon) which joins the Somme at Abbeville flows through a narrow chalk valley extending a few miles north of Abbeville. Three miles up this valley is the village of Drucat; and on the hill above the village, and about 100 feet above the stream, is a small outlier of high-level gravel which I have before described, and which is remarkable for the number and size of its sand- and gravel-pipes penetrating the underlying chalk. One of these which I measured was 22 feet across at the top and 18 feet at a depth of 30 feet, and I estimated its depth at not less than 100 feet from the surface. It was filled in the usual way with sand and gravel in vertical cylindrical layers. M. Boucher de Perthes has two flint implements which are reported to have come from the pit; but I never myself found any there, or any mammalian remains. The sand and gravel is clean and light-coloured, and very similar in character to some of the beds at Menchecourt, and in so far has the appearance of a fluviatile gravel, and, like it, is overlain by a variable bed of loess. This bed was supposed to form an isolated outlier; but on my last visit I found another bed, though of coarser materials, on a hill of the same height on the opposite side of the valley, above P'Heure. The valley at the foot of the hill on which the Drucat gravel is worked is about a quarter of a mile wide. A lane leads direct down the slope of the hill from a point near the gravel to the valley; and a roadside cutting exposes a section of calcareous tufa or travertin several feet thick, and containing in places numerous land shells, of recent species, and traces of plants. Half a mile beyond, the bed is of sufficient importance to be worked for building-purposes. This bed is overlain by the valley loess, and is in places intercalated with it; it commences a few feet below the level of the gravel at about 70 feet above the valley, and continues to near the foot of the hill.

Now it is well proved that in all purely chalk districts the line of water-level proceeds from the level of the streams and rivers traversing the dis-



4-4. Line of present water-level. Y. Gravel-pipe.

trict, in a slightly inclined and continuous plane rising on either side under the adjacent hills with a slope varying from 10 to 40 feet in the mile, the latter being an extreme case. If we take a mean of 20 feet, as the gravel-pit is not above one-third of a mile from the valley, the rise in the water underneath would not probably exceed 10 feet above the level of the stream. The chalk formation is so generally fissured and permeable that I know of no instance of a line of water-level or of springs occurring above the general line dependent upon the level of the adjacent rivers. It is also well known that strong springs are common at the foot of the hills along many of our chalk valleys, as, for instance, that at Amwell, those at Carshalton, and many along the valley of the Thames. These springs are more or less calcareous, often highly so.

It is evident that the travertin at Drucat has been formed by a deposit from a spring of considerable volume ; and it further appears that it flowed while the loess was in the course of formation. For the tufa could only have been formed at or near the level of the spring ; so that its continued deposit down the slope of the hill shows the spring to have been gradually lowered as the valley became deeper, and while subject to the continued inundations which deposited the loess. The line of present water-level in the chalk here is about 90 feet below the summit of the hill, as proved by a well in an adjacent farmhouse, and at the gravel-pit they have gone down 60 feet without reaching water. But the level of the upper part of the tufa shows the line of water-level or of springs to have been at one time 70 feet above the valley, which could only have happened when the bottom of the valley was on a level 60 to 70 feet higher than it now is. The gradual deepening of the valley is indicated by the gradual lowering of the spring until it reached to within from 20 to 30 feet of the present valley-level, when it became extinct. Further, we have in the adjacent bed of high-level gravel evidence of the origin of this important spring ; for the sands and gravel-beds are not only very thick, but they are also perfectly free from calcareous matter and very permeable, and they show in their numerous gravel-pipes how great must have been the volume and solvent power of the rain-water which at one time percolated through them. The water, after passing through the gravel and acting upon the underlying chalk to form these large vertical cavities, would, upon reaching the original line of water-level, have flowed off horizontally and escaped in a strong spring at the base of the adjacent slope. It there parted with its excess of the carbonate of lime, and so formed the calcareous tufa. This case furnishes therefore new and good evidence on two points :—first, on the connexion of the sand- and gravel-pipes with the percolation of fresh water through calcareous rocks ; and secondly, on the condition of the former land surface and of the springs, only possible on the hypothesis of former higher levels of the bottom of the valley and of its gradual excavation.